

Appl. No. : 10/644,690  
Filed : August 19, 2003

### AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A method for fabricating a thin-film opto-electronic device on a conductive silicon-containing substrate comprising the steps of growing a sequence of layers including at least the steps of:

a) forming a porous silicon layer on said substrate having a thickness in the range from 0.1 µm to 1 µm such that said porous silicon layer acts as a light diffuser and as a light reflector;

b) growing a non-porous layer on said porous silicon layer, said non-porous layer comprising at least one first region and at least one second region being formed in said non-porous layer, said first region of a first conductivity type, said second region of a second conductivity type, different from said first conductivity type,

and said sequence of layers being such that optical confinement is realised in said device.

2. (Original) A method as recited in claim 1, wherein said first region of a first conductivity type is acting as a light absorber.

3. (Original) A method as recited in claim 1, wherein said non-porous layer is a silicon-containing semiconductor layer, preferably a non-porous group IV and/or elemental and/or crystalline layer.

4. (Original) A method as recited in claim 3, wherein said non-porous layer is a Si or a SiGe or a Ge layer being grown by means of chemical vapour deposition or physical vapour or molecular beam epitaxy.

5. (Original) A method as recited in claim 1, wherein said porous silicon layer is formed by exposing the substrate to an electrochemical treatment or a chemical treatment or spark erosion.

6. (Currently Amended) A method as recited in claim 1; wherein said porous silicon layer has ~~a thickness in the range from 0.1 µm to 1 µm and~~ a porosity in the range from 20% to 70%.

7. (Original) A method as recited in claim 1, wherein the porous silicon layer formed comprises porous silicon parts and columnar conductive parts, said columnar conductive parts forming conductive connections between the substrate and the first region of the semiconductor layer; said substrate and said first region having the same conductivity type.

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8. (Original) A method as recited in claim 7, wherein prior to the formation of the porous silicon layer a patterned mask layer is formed on the substrate to thereby define at least one first area and at least one second area in the substrate, said first area being uncovered, said second area being covered with said mask layer; thereafter said porous silicon layer is formed on said first area and said mask layer is removed from said second area; thereafter a semiconductor layer is grown on said second area and on said porous silicon layer thereby creating said columnar conductive parts.

9. (Original) A method as recited in claim 1, wherein at least one third region is formed in said first region for contacting said first region, said third region being isolated from said second region and having the same conductivity type as said first region.

10. (New) A method as recited in claim 1, wherein forming a porous silicon layer on said substrate comprises forming a first porous layer with a first porosity and a second porous layer on said first porous layer, said second porous layer having a porosity that is different than the porosity of said first porous layer, said porous silicon layer having both light diffusing and light reflecting properties.

11. (New) A method for fabricating a thin-film opto-electronic device on a conductive silicon-containing substrate comprising the steps of growing a sequence of layers including at least the steps of:

- a) forming a porous silicon layer on said substrate such that said porous silicon layer acts as a light diffuser and as a light reflector;
- b) growing a non-porous layer on said porous silicon layer, said non-porous layer comprising at least one first region and at least one second region being formed in said non-porous layer, said first region of a first conductivity type, said second region of a second conductivity type, different from said first conductivity type; and

wherein said sequence of layers being such that optical confinement is realised in said device and wherein the porous silicon layer formed comprises porous silicon parts and columnar conductive parts, said columnar conductive parts forming conductive connections between the substrate and the first region of the semiconductor layer; said substrate and said first region having the same conductivity type.

12. (New) A method as recited in claim 11 wherein said porous silicon layer has a thickness in the range from 0.1 μm to 1 μm.

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13. (New) A method as recited in claim 11, wherein said first region of a first conductivity type is acting as a light absorber.

14. (New) A method as recited in claim 11, wherein said non-porous layer is a silicon-containing semiconductor layer, preferably a non-porous group IV and/or elemental and/or crystalline layer.

15. (New) A method as recited in claim 14, wherein said non-porous layer is a Si or a SiGe or a Ge layer being grown by means of chemical vapour deposition or physical vapor or molecular beam epitaxy.

16. (New) A method as recited in claim 11, wherein said porous silicon layer is formed by exposing the substrate to an electrochemical treatment or a chemical treatment or spark erosion.

17. (New) A method as recited in claim 11, wherein said porous silicon layer has a porosity in the range from 20% to 70%.

18. (New) A method as recited in claim 11, wherein forming a porous silicon layer on said substrate comprises forming a first porous layer with a first porosity and a second porous layer on said first porous layer, said second porous layer having a porosity that is different than the porosity of said first porous layer, said porous silicon layer having both light diffusing and light reflecting properties.

19. (New) A method for fabricating a thin-film opto-electronic device on a conductive silicon-containing substrate comprising the steps of growing a sequence of layers including at least the steps of:

forming a porous layer on said substrate such that said porous layer acts as a light diffuser and as a light reflector;

growing a non-porous layer on said porous layer, said non-porous layer comprising at least one first region and at least one second region being formed in said non-porous layer, said first region of a first conductivity type, said second region of a second conductivity type, different from said first conductivity type, said sequence of layers being such that optical confinement is realized in said device; and

forming conductive connections between the substrate and the first region of the semiconductor layer, said substrate and said first region having the same conductivity type.

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20. (New) A method as recited in claim 19 wherein said porous layer comprises silicon and has a thickness in the range from 0.1  $\mu\text{m}$  to 1  $\mu\text{m}$ .

21. (New) A method as recited in claim 19, wherein said first region of a first conductivity type is acting as a light absorber.

22. (New) A method as recited in claim 19, wherein said non-porous layer is a silicon-containing semiconductor layer, preferably a non-porous group IV and/or elemental and/or crystalline layer.

23. (New) A method as recited in claim 19, wherein said porous layer comprises a first porous layer and a second porous layer and forming a porous layer on said substrate comprises forming said first porous layer with a first porosity and said second porous layer on said first porous layer, said second porous layer having a porosity that is different than the porosity of said first porous layer, said porous layer having both light diffusing and light reflecting properties.